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IS 4794-2 (1986): Push button switches, Part 2: Push button switches, Type 1 [LITD 3: Electromechanical Components and Mechanical Structures for Electronic Equipment]



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IS : 4794 (Part 2) - 1986

(Reaffirmed 2002)

Edition 1.1

(1989-07)

Indian Standard

**SPECIFICATION FOR
PUSH-BUTTON SWITCHES**

PART 2 PUSH-BUTTON SWITCHES, TYPE 1

(Incorporating Amendment No. 1)

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**BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002**

Price Group 4

Indian Standard

SPECIFICATION FOR PUSH-BUTTON SWITCHES

PART 2 PUSH-BUTTON SWITCHES, TYPE 1

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Indian Standard
SPECIFICATION FOR
PUSH-BUTTON SWITCHES

PART 2 PUSH-BUTTON SWITCHES, TYPE 1

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 4 March 1986, after the draft finalized by the Electromechanical Components for Electronic Equipment Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 The object of this standard (Part 2) is to specify detailed requirements for push-button switches. The general requirements for push-button switches are covered in IS : 4794 (Part 1)-1968*.

0.3 Some general notes on push-button switches covered by this standard are given in Appendix A.

0.4 This edition 1.1 incorporates Amendment No. 1 (July 1989). Side bar indicates modification of the text as the result of incorporation of the amendment.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part 2) covers requirements for push-button switches (Type 1) used in consumer electronics like wave band change switches in mains/transistorized battery operated radio receivers.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in 2 of IS : 4794 (Part 1)-1968* shall apply.

*Specification for push-button switches: Part 1 General requirements and tests.

†Rules for rounding off numerical values (*revised*).

IS : 4794 (Part 2) - 1986

3. CATEGORIES

3.1 Provisions of category 3 of IS : 4794 (Part 1)-1968* shall apply.

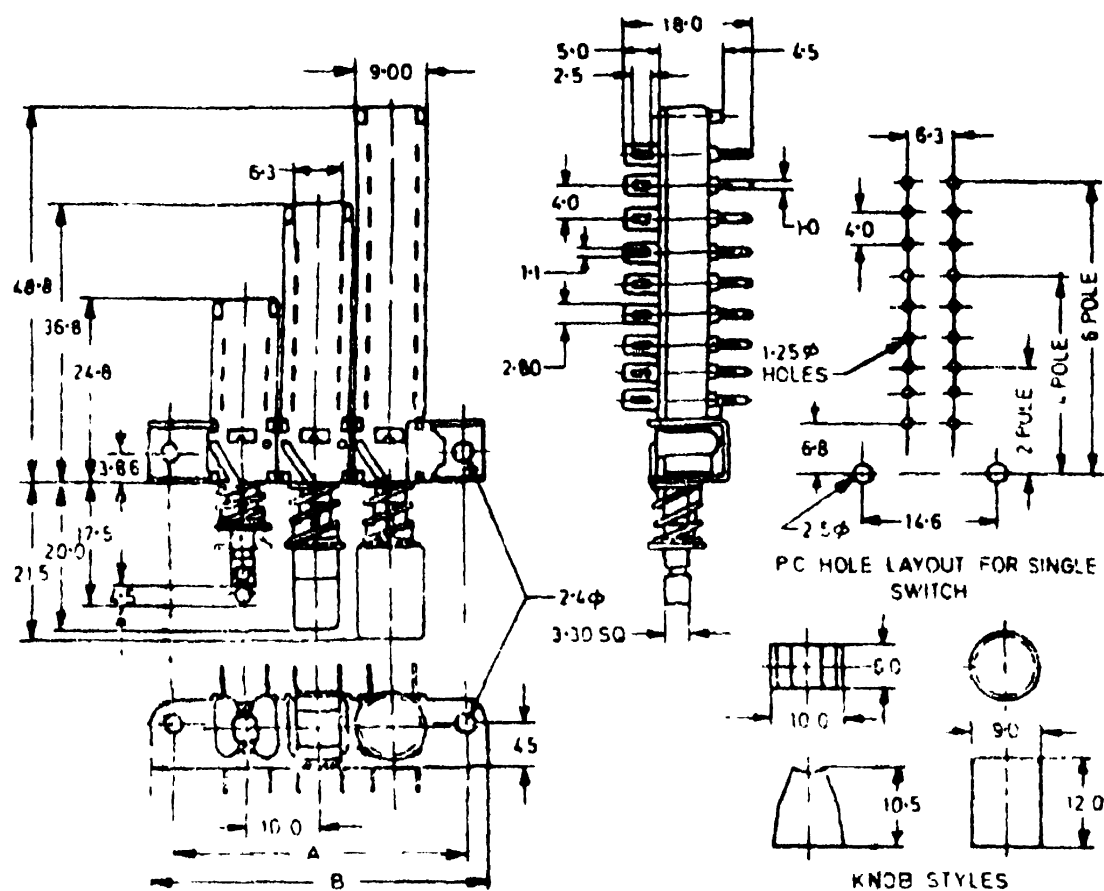
4. ELECTRICAL RATINGS

4.1 The ratings shall be as given below:

- a) Voltage ratings — $> 24 \text{ V}$ but $\leq 500 \text{ V}$ (dc).
- b) Current ratings — $\leq 1 \text{ A}$.

5. MOUNTING DIMENSIONS

5.1 The mounting dimensions are given in Fig. 1.



NO. OF SWITCHES	1	2	3	4	5	6	7	8	9	10
A	14.6	29.0	39.0	49.0	59.0	69.0	79.0	89.0	99.0	109.0
B	19.1	35.0	45.0	55.0	65.0	75.0	85.0	95.0	105.0	115.0

All dimensions in millimetres.

FIG. 1 DIMENSIONAL DETAILS (TYPICAL) OF PUSH-BUTTON SWITCH

*Specification for push button switches: Part I General requirements and tests.

6. MATERIALS AND WORKMANSHIP

6.1 Provisions of 5 of IS : 4794 (Part 1)-1968* shall apply.

7. MARKING

7.1 Provisions of 6 of IS : 4794 (Part 1)-1968* shall apply.

8. CONDITIONS FOR TESTS

8.1 Classification of Tests — Provisions of 7.1 of IS : 4794 (Part 1)-1968* shall apply.

8.2 General Conditions for Tests — Provisions of 7.2 of IS : 4794 (Part 1)-1968* shall apply.

9. REQUIREMENTS

9.1 The requirements shall be verified according to the relevant clauses of IS : 4794 (Part 1)-1968*.

9.2 The requirements for push-button switches shall be as given in Table 1.

TABLE 1 REQUIREMENTS FOR PUSH-BUTTON SWITCHES

SL NO.	TEST	CONDITIONS OF TEST	REQUIREMENT
<i>MECHANICAL</i>			
i)	Robustness of terminations	--	There shall be no sign of mechanical damage or loosening of parts and the switch shall be mechanically operatable
ii)	Tensile test	An axial load of 20 N shall be applied for 10 s	No change in contact resistance
iii)	Bending test	Two consecutive bends at 90° shall be given	No change in contact resistance
iv)	Solderability of terminations	This shall be checked by dipping the terminations in solder bath. Solder bath temperature $230 \pm 10^\circ\text{C}$, duration 2 ± 0.5 s for PCB and $270 \pm 10^\circ\text{C}$, 4 s for hand soldering	There shall be a good flow of solder

(Continued)

*Specification for push-button switches: Part 1 General requirements and tests.

TABLE 1 REQUIREMENTS FOR PUSH BUTTON SWITCHES — *Contd*

Sl No	TEST	CONDITIONS OF TEST	REQUIREMENT
v)	Thermal shock	This shall be checked by touching the terminations by a soldering iron	There shall be no sign of mechanical damage or loosening of parts and the switch shall be mechanically operable
		Temperature $350 \pm 10^\circ\text{C}$ Duration 3.5 ± 0.5 s	No change in contact resistance
vi)	Operating torque/force	Switch should be suitably mounted	8 N <i>Max</i> 4 N <i>Min</i>
vii)	End steps torque/force	A force of 50 N shall be applied against stops	There shall be no sign of mechanical damage or loosening of parts and the switch shall be mechanically operable No change in contact resistance
viii)	Contact force	—	0.6 — 0.9 N
	<i>Mechanical</i>	The switch should be soldered to PCB for PB mounting type. Other switches should be suitably mounted	
i)	Contact resistance	The switches shall be fully operated three times on no load before measurement. The contact resistance shall then be measured across each pair of terminations at a current ≤ 1 A and from a source whose open circuit voltage is ≤ 2.5 V dc	≤ 10 m ohm
ii)	Insulation resistance	The insulation resistance shall be measured after electrification for 1 min by a dc potential of 100 ± 15 V. The insulation resistance shall be measured between the following points	
		a) two adjacent terminations having minimum spacing and	≥ 1000 Mohm
		b) all terminations connected together and all other exposed metal parts	≥ 1000 Mohm

(*Continued*)

TABLE 1 REQUIREMENTS FOR PUSH-BUTTON SWITCHES — *Contd*

SL NO.	TEST	CONDITIONS OF TEST	REQUIREMENT
iii)	Voltage proof (high voltage)	1 000 V rms shall be applied for one minute between points indicated in (ii)	No breakdown or flash over
iv)	Capacitance	The capacitance shall be measured at 1 MHz between	
		a) individual terminations forming a part of a circuit but not in electrical contact, and	$\leq 1.5 \text{ pF}$
		b) individual terminations and all other terminations connected to the frame	$\leq 2 \text{ pF}$
v)	RF shunt resistance	The resistance shall be measured at 1 MHz between	
		a) two terminations whose contacts are open, and	$> 2 \text{ Mohm}$
		b) one termination and all other terminations which are connected to earth	$> 2 \text{ Mohm}$
vi)	Vibration	The switches shall be mounted and fastened rigidly to a suitable test jig. The test jig shall be vibrated in three different directions mutually perpendicular to each other, under one of the two conditions given below.	a) No visible damage b) Maximum change in contact resistance $\leq \pm 50$ percent of original value
		A circuit with a lamp shall be connected to switch.	No momentary switching operations during the test

(*Continued*)

TABLE 1 REQUIREMENTS FOR PUSH-BUTTON SWITCHES — *Contd*

SL NO.	TEST	CONDITIONS OF TEST	REQUIREMENT
		Displacement 0.75 mm (10 g) for Portable sets	
		Displacement 0.35 mm (5 g) for table models	
		Approximate sweep time	1 min
		Frequency range linear	10-55-10 Hz
		Number of sweep cycles in each of three direction	{ For portable sets -- 120 For table models -- 30
		Approximate total time	{ For portable sets -- 6 h For table models -- 1.5 h
vii)	Bumping	The switches shall be mounted on the bump test machine and connected in a circuit as mentioned in (vi) above	No momentary switching operation during test No visible damage
		No. of bumps : 4 000 ± 10 Acceleration : 390 m/s ² (40 g)	Maximum change in con- tact resistance ≤ ± 50 percent of original values
		Pulse duration . 6 ms	

(*Continued*)

TABLE 1 REQUIREMENTS FOR PUSH-BUTTON SWITCHES — *Contd*

SL NO.	TEST	CONDITIONS OF TEST					REQUIREMENT
		Tempe- rature	Relative Humidity	Dura- tion	Reco- very Time	Characteris- tics to be C h e c k e d After Test	
CLIMATIC TESTS							
i) <i>Climatic Sequence</i>							
This test shall be performed on the same samples in the following sequence:							
a) Dry heat	+ 70°C ± 3°C	50 percent	16 h	0	Insulation resistance	> 1 000 Mohm	
				1.5 ± 0.5 h	Operating force	< 20 N	
b) Damp heat (cyclic) (first cycle)	+ 55°C ± 2°C to + 25°C ± 3°C	93 ± 3 percent ≥ 95 per- cent	12 ± ½h 12 ± ½h	1.5 + 0.5 h	Visual ins- pection	No corrosion or mechanical deterioration or any other visible damage	
c) Cold	- 10°C		4 h	0	1) Switch operation	Mechanically and electri- cally operable No sign of deterioration	
				1.5 ± 0.5 h	2) Visual ins- pection		
d) Damp heat (cyclic) (remaining cycles)	+ 55°C ± 2°C to + 25°C ± 3°C	93 ± 3 percent	12 ± ½h	1.5 ± 0.5 h	1) Insulation resistance 2) Voltage proof 3) Contact resistance 4) Operating force 5) Visual ins- pection	1) > 100 Mohm 2) No flashover breakdown 3) ≤ 10 Mohm ± 50 percent 4) 8 N, <i>Max</i> 4 N, <i>Min</i> 5) No corrosion or any other visible dam- age	
		≥ 95 per- cent	12 ± ½h	24 h	Insulation resistance	> 100 Mohm	

(*Continued*)

IS : 4794 (Part 2) - 1986

TABLE 1 REQUIREMENTS FOR PUSH BUTTON SWITCHES — *Contd*

Sl. No.	TEST	CONDITIONS OF TEST					REQUIREMENT
		Temperature	Relative Humidity	Load Polarizing Voltage dc	Duration	Recovery Period	
ii) Damp heat (steady state)							
Sample I	40 ± 2°C	90-95 percent	15 Vdc between adjacent terminations having minimum spacing	21 × 24 h	1.5 ± 0.5 h	1) Insulation proof 2) Voltage proof 3) Contact resistance 4) Visual examination	> 100 Mohm No flashover or breakdown Initial resistance ± 50 percent of initial resistance subject to ≤ 10 mohms No corrosion or any other visible damage
Sample II	do	do	15 Vdc between all terminations connected together and all other metal parts	do	do	1) Insulation resistance 2) Voltage proof 3) Contact resistance 4) Operating force	> 100 Mohm No flashover or breakdown Initial resistance ± 50 percent of initial resistance subject to ≤ 10 mohms 8 N, Max 4 N, Min
Sample III	do	do	—	do	do	do	do
iii) Rapid change of temperature (5 cycles)	+70°C to -10°C	—	—	30 min. change over time 3 min	1.0 ± 0.5 h	1) Insulation resistance 2) Voltage proof 3) Contact resistance 4) Visual inspection	> 100 Mohm No flashover or breakdown Initial resistance ± 50 percent of initial resistance, subject to ≤ 10 mohms No visible damage

(Continued)

TABLE 1 REQUIREMENTS FOR PUSH-BUTTON SWITCHES — *Contd*

SL No.	TEST	TEST CONDITION	CHARACTERISTICS TO BE MEASURED	REQUIREMENT
ENDURANCE				
i)	With load	The switches shall be operated mechanically to make and break the main contacts 10 000 times for independent version and 1 6000 times for interdependent version. The switch should be mounted on PCB. The frequency of switching for this test shall be between 9 to 15 complete switching cycle per minute. The test shall be carried out using a resistive circuit with 30 V (dc) and 100 mA	1) Insulation resistance 2) Voltage proof 3) Contact resistance 4) Functional check 5) Visual examination	> 1 000 Mohm No flashover or breakdown 10 Mohms initial and 50 Mohms after life Mechanically and electrically operable. No objectionable crackle No damage
ii)	With temperature test (without load)	The following test shall be carried out: The switch should be mounted on PCB. The frequency of switching for this test shall be between 9 to 15 complete switching cycle per minute 8 000 times switching + storage for 72 h at 70°C + 1 000 times switching + storage for 72 h at - 10°C + 7 000 times switching	1) Insulation resistance 2) Voltage proof 3) Contact resistance 4) Functional check 5) Visual examination	> 1 000 Mohm No flashover or breakdown ≤ 20 mohm Mechanically and electrically operable. No objectionable crackle in 3 cm drop check No damage
iii)	With humidity test (without load)	The following test shall be carried out: The switch shall be mounted on PC board	1) Insulation resistance 2) Voltage proof 3) Contact resistance	> 100 Mohm No flashover or breakdown ≤ 20 Mohm

(Continued)

TABLE 1 REQUIREMENTS FOR PUSH BUTTON SWITCHES — *Contd*

SL NO	TEST	TEST CONDITION	CHARACTERISTICS TO BE MEASURED	REQUIREMENT
		The frequency of switching shall be between 9 to 15 complete cycles/min	4) Functional check	Mechanically and electrically operable No objectionable crackle in 3 cm drop check
		8 000 times switching + storage for 500 h under 40°C, 90-95 percent relative humidity condition + 8 000 times switching	5) Visual check	No visible damage

APPENDIX A

(Clause 0 2)

GENERAL NOTES ON PUSH-BUTTON SWITCHES

A-1. Packaging for the switches should be such that no damage occurs to switch during its handling in transit

A 2. It should be possible to mount switches of PB mounting type without the help of any auxiliary tools Switches should be calibrated to the required mounting spacing

A-3. Switches for connecting to the supply mains shall fulfil the safety requirements as specified in IS 616 1981*

A-4. Sequence of type approval shall be according to Appendix B.

*Safety requirements for mains operated electronic and related apparatus for household and similar general use (*first revision*)

APPENDIX B

(Clause A-4)

SEQUENCE OF TYPE TESTS
(MINIMUM NUMBER OF SAMPLES 24)*All 24 Samples*

Visual examination
Dimensions
Contact resistance
Insulation resistance
Voltage proof
Capacitance

<i>First Lot</i> (8 Samples)	<i>Second Lot</i> (8 Samples)	<i>Third Lot</i> (8 Samples)
Operating force	Damp heat (steady state)	Endurance 4 samples with load
End stop force	4 samples without load	2 samples with temperature test
Robustness of termination	2 samples each with each load condition	2 samples with humidity test
Soldering		
Vibration		
Bumping		
Rapid change of temperature		
Climatic sequence		

Criteria for Approval — The components shall be considered to satisfy the type tests if each sample tested passes the test or tests to which it is subjected.

Rejection and Re-testing — In case of failure in any one test, the requirements of type approval may be considered as not having been satisfied and fresh samples not exceeding the original number may be called for to undergo repeat tests. In such cases, a detailed report on the tests carried out shall be furnished. Fresh samples may be submitted after incorporating in the switches, any modifications, if considered necessary. The specific test or tests to be carried out on the fresh samples shall be decided by the testing authority who may wish to carry out all the related tests whether or not the earlier samples passed these tests satisfactorily. If, in the repeat test(s), no single failure occurs, the type shall be considered to be eligible for approval.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

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